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REMARKS

Claims 17-30 are currently pending in the subject application. Claims 17 and 24 are independent.

Applicant requests, in the next Office action, that the Examiner indicate the acceptability of the drawings filed on October 15, 2003.

Claims 17-30 are presented to the Examiner for further prosecution on the merits.

A. Asserted Rejection of Claims 17-30

In the outstanding Office action, the Examiner rejected claims 17-30 under 35 U.S.C. § 102(e) as being anticipated by, or, in the alternative, under 35 U.S.C. § 103(a) as being obvious over, applicant's admitted prior art ("AAPA"). Applicant respectfully traverses this rejection.

1. "Applicant's Admitted Prior Art"

Regarding the Examiner's characterization of "Applicant's Admitted Prior Art," applicant notes that MPEP § 2129(I) provides that, "[a] statement by an applicant during prosecution identifying the work of another as "prior art" is an admission that that work is available as prior art against the claims." The only portions of the application to be identified as "prior art" are FIGS. 2A and 2B. These figures illustrate aspects of a particular reference, *viz.*, U.S. Patent No. 5,234,777 to Wilson ("the Wilson reference"). While the Description of the Related Art section provides some discussion of the Wilson reference, as well as a discussion of an article published in *Electrochemica Acta* (see page 4 of the Description of the Related Art), applicant respectfully submits that the entire Description of the Related Art section is not "prior art."

2. The teachings of the Wilson reference

In the outstanding Office action, the Examiner asserted, "applicant's admitted prior art discloses carbon particles [22] and catalytic metal particles [23] having a 'catalyst-and-carbon particles contact surface' which coat the proton exchange membrane." *Office action of June 6, 2006, page 3.* Apparently, the Examiner considers the presence of a "catalyst-and-carbon particles contact surface" to anticipate or render obvious the membrane-electrode assembly recited in claim 17. Applicant respectfully disagrees.

Applicant included in the Description of the Related Art section a description of the disadvantages associated with the approach disclosed in Wilson reference. This description states,

> However, this method is disadvantageous in that the entire volume of carbon particles cannot be fully utilized because carbon particles are tens to hundreds times larger than catalytic metal particles. Furthermore, another drawback lies in that a contact area between the proton exchange membrane and the catalytic layers, where catalytic reactions take place, is very small. Because the reactions, such as diffusion of reaction gases, or collection of current, take place in the catalyst-and-carbon particles contact surface, such a catalyst structure in which a relatively large carbon particle is loaded with a large number of catalytic particles is considered as being inefficient.

Description of the Related Art of the subject application, at pages 3-4 (emphasis added).

This describes a disadvantage of the approach taught by the Wilson reference, namely, that the catalyst-and-carbon particles contact surface that lies at an interface, or contact area, *between* a proton exchange membrane *and* a catalytic layer, is very small. Thus, it is apparent that applicant's description of the Wilson reference points out a significant structural distinction between the claimed membrane-electrode assembly and the structure described in the Wilson reference, namely, that the Wilson reference's formation of a *separate* catalyst layer results in inefficiencies due to a limited reaction area.[1]

3. Distinctions between the prior art and the claimed invention

Independent claim 17 recites,

> A fuel cell having a membrane-electrode assembly, the membrane-electrode assembly being fabricated by a method, the method comprising:
>
> coating catalytic metal particles on a proton exchange polymer membrane by sputtering a catalytic metal source;
>
> coating carbon particles on the proton exchange polymer membrane by arc discharging or by sputtering a carbon source to form a nanophase catalyst layer; and
>
> bonding electrodes to the proton exchange polymer membrane having the nanophase catalyst layer.

In the outstanding Office action, the Examiner asserted that claim 17 is anticipated or rendered obvious by AAPA. Applicant respectfully disagrees, and submits that the Examiner has failed to provide any rationale for the assertion that a structure formed by laminating a separate catalytic film onto a membrane, as taught by the Wilson reference, would be the same as one formed by sputtering catalytic metal and carbon particles onto a membrane, as recited in claim 17.

As noted above, the Wilson reference provides for the application of a separately prepared catalyst-containing film to a proton exchange membrane, which results in a limited contact area between the film and the membrane. Accordingly, applicant respectfully submits that there are significant structural and functional differences between the membrane catalyst layer of the Wilson reference and the membrane-electrode assembly recited in claim 17, since embodiments of the present invention provide a membrane-electrode assembly formed by coating catalytic metal particles on a proton exchange membrane by sputtering and coating carbon particles on the proton exchange membrane by arc discharging or sputtering.

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[1] See also the Abstract of the Wilson reference, which states, "A gas reaction fuel cell incorporates a thin catalyst layer between a solid polymer electrolyte (SPE) membrane and a porous electrode backing. . . . The

For example, a membrane-electrode assembly according to an embodiment of the present invention may have a uniform dispersion of nano-sized catalytic metal, and the sputtering conditions may be varied so as to control the particle size and degree of dispersion of the catalytic metal. *See, e.g., FIGS. 2D-2F and pages 8-9 of the application as originally filed.* Similarly, the uniformity and size of the coated carbon particles may be accurately controlled, and the shape and size of the coated carbon particles may be similar to those of the coated catalytic metal. *See, e.g., page 11 of the application.* Thus, ultrafine catalytic metal particles may easily penetrate into the proton exchange polymer membrane through small cavities formed on the surface, which allows oxidation and reduction reactions to occur at the surface of the proton exchange polymer membrane with a high degree of efficiency. *See page 18 of the application.*

Applicant respectfully submits that the Examiner has failed to identify any such attributes in the Wilson reference, or any other prior art reference. In particular, applicant respectfully submits that the Examiner has failed to demonstrate how the separate preparation of the catalytic film described in the Wilson reference would result in the same structure as that obtained through the process recited in claim 17, whereby catalytic metal particles and carbon particles are applied to the membrane through, e.g., sputtering.[2] Accordingly, applicant respectfully submits that none of the cited prior art references, whether alone or in combination, anticipates or renders obvious the subject matter recited in claim 17.

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cured film is then transferred to the SPE membrane . . . to form a catalyst layer."

[2] *See also MPEP § 2113, which states "the structure implied by the process steps should be considered . . . where the manufacturing process steps would be expected to impart distinctive structural characteristics to the final product."*

With regards to the rejection of independent claim 24, applicant notes that claim 24 recites similar limitations to those discussed above regarding claim 17. In particular, applicant notes that claim 24 recites sputtering catalytic metal and carbon particles on a proton exchange polymer membrane, in contrast to the Wilson reference, which separately prepares a catalytic metal film and adheres that film to a solid polymer electrolyte membrane.

4. Dependent claims

In the outstanding Office action, the Examiner rejected each of the dependent claims with a single blanket statement,

> Regarding the particle size of the catalytic metal and the catalyst metal loading, for the reasons set forth in the prior Office action absent of unexpected results it is asserted that these are optimizable parameters for result-effective variables, such as the electrochemical potential of the cell. *In re Boesch*, 61 7 F.2d 272,205 USPQ 215 (CCPA 1980).

Office action of June 6, 2006, at page 4.

As an initial matter, applicant notes that the rejections set forth in the prior Office action have been withdrawn by the Examiner. *Office action of June 6, 2006, at page 2.* Moreover, applicant submits that the Examiner has failed to demonstrate a recognition by the cited prior art references that each of the variables claimed in the dependent claims are result-effective variables.[3] For example, dependent claims 19 and 26 recite particle size ranges for the coated catalytic metal and carbon particles. However, the Wilson reference fails to even *mention* particle sizes and, in particular, fails to mention the significance of the sizes of catalyst particles in relation to carbon particles. Therefore, applicant respectfully submits that the Examiner failed to set forth a *prima facie* case of obviousness with regards to each of the dependent claims.

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[3] See MPEP § 2144.05(II)(B), which states "[a] particular parameter must first be recognized as a result-effective variable, i.e., a variable which achieves a recognized result, before the determination of the optimum or workable ranges of said variable might be characterized as routine experimentation. *In re Antonie*, 559 F.2d 618, 195 USPQ 6 (CCPA 1977) (emphasis added).

In view of the above, applicant respectfully submits that the claims are neither anticipated nor rendered obvious by the cited prior art. Accordingly, applicants respectfully submit that indendent claims 17 and 24, as well as claims 18-23 and 25-30 depending therefrom, are allowable over the cited prior art. Therefore, applicants respectfully request that this rejection be reconsidered and withdrawn.

B. Conclusion

If the Examiner believes that additional discussions or information might advance the prosecution of the instant application, the Examiner is invited to contact the undersigned at the telephone number listed below to expedite resolution of any outstanding issues.

In view of the foregoing amendments and remarks, reconsideration of this application is earnestly solicited, and an early and favorable further action upon all the claims is hereby requested.

Respectfully submitted,

LEE & MORSE, P.C.

Date: September 6, 2006

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